CBEA High-Efficiency Troffer Lighting Specification

A Commercial Building Energy Alliance (CBEA) Project
Version 3.0, Released 2/15/2012

A. General Description: 1'×4', 2'×2' or 2'×4' Troffer

B. Application
- Ceiling application
  - Ceiling types
    - F (Flanged)
    - M (Modular) and Z (Z Spline)
    - G (Grid)
    - SS (Screw Slot)
    - Plaster Frame Kit
- Mounting
  - Recessed
  - Surface-mounted

C. Construction/Finish
- Dimensions
  - Nominal dimensions:
    - 1'×4' – width = 12", length = 48"
    - 2'×2' – width = 24", length = 24"
    - 2'×4' – width = 24", length = 48"
  - Maximum height (depth) = 5"
- No visible welding, plane-protruding screws, latches, springs, hooks, rivets or plastic supports viewed from the occupied (room) side
- Air-handling capability (optional)
- Recessed, Type IC (intended for insulation contact) (optional)
- Earthquake clips (optional)
- NYC electrical code (optional)
- Chicago electrical code (optional)

D. Electrical
- Operating voltage: 24 Vdc, 120 Vac at 60 Hz, 277 Vac at 60Hz, or universal voltage (120, 220/240, 277 Vac at 50/60 Hz)
- Power factor: ≥ 0.90 (at full luminaire output and across specified voltage range)
- Total harmonic distortion: ≤ 20% (at full luminaire output and across specified voltage range)
- Surge protection: ANSI C62.41-2002 Category A surge protection standards up to and including 2.5 kV
- Sound: Class A not to exceed a measured value of 24dB
- Maximum standby power: 1W
- Power supply/driver/ballast
  LED Power Supply/Driver

- Driver efficiency (at full load):
  - ≥ 85% for drivers capable of ≥ 50 watts
  - ≥ 80% for drivers capable of < 50 watts
- Federal Communications Commission (FCC) compliance: FCC Part 15 Class A (Commercial) requirements for EMI/RFI emissions

Fluorescent Ballast

- Lamp current crest factor: ≤ 1.7
- FCC compliance: FCC Part 18 Non-Consumer requirements for EMI/RFI emissions
- End-of-lamp-life protection for T5 and smaller lamps

E. Accessibility for Maintenance
- Power supplies/drivers/ballasts, LED arrays, boards or light engines shall be easily field replaceable using common hand tools (e.g., screwdrivers, pliers, etc.) and without uninstalling the luminaire

F. Photometric Performance
- Minimum initial luminaire lumens

  LED Luminaires
  - 1'×4' – 2,000 initial lumens
  - 2'×2' – 3,000 initial lumens
  - 2'×4' – 4,000 initial lumens

  Fluorescent Luminaires
  - 1'×4' – 1,800 initial lumens
  - 2'×2' – 2,700 initial lumens
  - 2'×4' – 3,600 initial lumens
- Minimum luminaire efficacy
  - 1'×4' – 74 lm/W
  - 2'×2' – 69 lm/W
  - 2'×4' – 74 lm/W
- Spacing criteria (SC): The ratio of center-to-center fixture spacing to mounting height (ceiling-to-work plane)

	0° – 180° Plane	90° – 270° Plane
1'×4'	1.05 – 1.40	1.15 – 1.80
2'×2'		1.10 – 1.70
2'×4'		1.15 – 1.80

G. Chromaticity
- Correlated Color Temperature (CCT): Only allowed CCTs are 2700K, 3000K, 3500K, 4000/4100K, 4500K and 5000K

  LEDs
  - Acceptable tolerances as provided in ANSI C78.377-2008
  - Color rendering index (CRI): ≥ 80 with a positive R_9 value
  - Tested per LM-79-2008

  Fluorescent Lamps
  - Acceptable tolerances as provided in ANSI C78.376-2001
  - NEMA designated lamp (T5, T8, biaxial, etc.)

- CRI ≥ 80

H. Lumen maintenance/rated lamp life

LEDs

- ≥ 77.4% of initial lumens @ 36,000 hours (this equates to a ≥ 70% of initial lumens @ 50,000 hour target)
- Determined by IES LM-80 data [parameters (drive current and steady-state temperature) determined by the In-situ Temperature Measurement Test (ISTMT)] then applying IES TM-21 procedure evaluated @ 36,000 hours

-OR-

- The requirement may also be met by IES LM-80 data intersection of the exponential decay function $L_{70} = L_{100}e^{-\lambda t}$, where L = Luminance; λ is a constant; t = time = 35,000 hours (based upon LM-80 data and ISTMT, evaluated @ 6,000 hours with minimum lumen maintenance of 94.1%).

Fluorescent Lamps

- Minimum rated life of 30,000 hours (based upon programmed rapid start ballast with a 12-hour operating cycle)

I. Standards

- IES LM-63-2002, Standard File Format for Electronic Transfer of Photometric Data
- UL 1598-2008 NMX-J-307/1-ANCE/C22.2 NO.250.0-08, Luminaires

LEDs

- IES LM-79-2008, Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products
- IES LM-80-2008, Approved Method: Measuring Lumen Maintenance of LED Light Sources
- IES TM-21-2011, Projecting Long Term Lumen Maintenance of LED Light Sources
- ANSI/NEMA/ANSLG C78.377-2008, Specifications for the Chromaticity of Solid-State Lighting (SSL) Products
- ANSI/UL 8750-2009, Standard for Light Emitting Diode (LED) Equipment for Use in Lighting Products
- ISTMT, contained within the ENERGY STAR Manufactures Guide: www.energystar.gov/index.cfm?c=ssl_res.pt_ssl

Fluorescent

- IES LM-9-2009, Electrical and Photometric Measurements of Fluorescent Lamps
- IES LM-41-1998, Photometric Testing of Indoor Fluorescent Luminaires
- ANSI C78.376-2001, Specifications for the Chromaticity of Fluorescent Lamps

J. Optional Provisions

- Emergency lighting
  - Emergency battery pack available factory or field installed
- Dimming
  - Manufacturers shall provide listing of compatible dimmers that have been tested and approved for use with their products.
  - Dimming protocols
    - Analog 0-10v dimming
    - Step dimming from 100% to at least one preset level between 70% and 10%
    - Continuous, flicker-free dimming from 100% to 20%

        - Continuous, flicker-free dimming from 100% to 10%
        - Continuous, flicker-free dimming from 100% to 5%
        - Open digital dimming protocols, both wired (e.g., DALI or DMX/RDM) and wireless (e.g., ZigBee)
- Controls
    - Daylight sensing
    - Occupant/motion sensing
    - Constant lumen management
    - Load shedding/demand response
- Centralized power conversion/controls/metering
    - Power conversion
        - System shall have centralized power conversion from high voltage AC to low voltage DC.
        - Capable of powering a minimum of four discrete luminaires
    - Controls/metering
        - Standby power draw: <10W at the central power supply
        - Contains ambient temperature sensor(s)
        - Contains sensor(s) for motion detection
        - Contains fixture current and voltage sensor for integrated power metering
        - Field-upgradeable for new fixture types or future sensor package upgrades and modifications